



# NC CLEAN ENERGY TECHNOLOGY CENTER

Advancing Clean Energy for a Sustainable Economy

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## Ethanol Fuel for North Carolina

### What is ethanol?

Ethanol is a high-octane, naturally oxygenated fuel typically produced by fermenting organic materials such as corn, grains, and sugarcane, as well as crop and forestry waste materials. Ethanol is blended in almost all regular 87 octane gasoline, and E85 (85% ethanol / 15% gasoline) is an alternative fuel for flexible fuel vehicles (FFVs). E15 (15% ethanol / 85% gasoline) was approved by the EPA in 2012 and is now also available in numerous stations in North Carolina and across the country.



### What types of vehicles can use ethanol?

E10 can be used in any gasoline vehicle without modification. E15 may be used in vehicles with model year 2001 and newer. This group of cars currently comprises 85% of the American automotive fleet. In addition, nearly 70% of new cars sold in 2016 will be explicitly warrantied for the use of E15 by the auto manufacturers. It's also important to know that there have been no reported cases of engine damage or misfueling of E15. Fueling with E15 typically costs less than regular gasoline.

E85, however, must be used in specified vehicles. All major domestic automakers offer E85 compatible vehicles, or flex-fuel vehicles (FFVs), at the same price as gasoline only models. FFVs are often easily identified with a vehicle badge or insignia and/or a yellow gas cap. FFVs, which can run on either E85 or gasoline, or any blend in between, allow vehicle operators the ability to obtain regular unleaded gasoline in areas where E85 is not available. FFVs can include buses, light-duty vehicles and delivery trucks. For a complete up-to-date list of available E85 compatible vehicles visit [CleanTransportation.org](http://CleanTransportation.org).

### How does ethanol perform?

Vehicles operating on E10 and E15 achieve the performance and range expected from regular gasoline. Vehicles running on E85 will have a shorter range than gasoline vehicles because a gallon of ethanol has 17-27% less energy content than a gallon of gasoline (DOE AFDC). However, it also typically costs less than gasoline resulting in cost savings despite the reduced energy content. E10, E15 and E85 burn more completely and at a cooler temperature than gasoline, resulting in fewer combustion deposits and longer spark plug life.

## Where can I get ethanol?

North Carolina has **24** public E85 and **21** E10 fuel stations. The most current list of public and government fleet stations can be found at [CleanTransportation.Org](http://CleanTransportation.Org). State and local government fleets may purchase E10 and E85 in all 100 counties from a state purchasing contract ([www.doa.state.nc.us/PandC/fuelcost.htm](http://www.doa.state.nc.us/PandC/fuelcost.htm)).

## What are the benefits of using ethanol?

Ethanol diversifies the American fuel supply, creates a cost competitive marketplace and provides an alternative market for farmers- which helps to reduce price volatility for crops. Using ethanol made from crop waste, municipal solid waste or forestry waste materials can also reduce emissions and provide a positive energy balance ratio. Vehicles running on ethanol fuels emit less carbon monoxide and other toxic chemicals, such as benzene, than those running on gasoline. They also emit the same or lower levels of hydrocarbon and non-methane hydrocarbons. E85 has fewer highly volatile chemicals than gasoline, resulting in fewer evaporative emissions.

E10 however, may result in greater evaporative emissions. Ethanol blended fuels derived from grain will result in lower life-cycle carbon dioxide emissions because they are derived from plant material which absorbs carbon dioxide as it grows. A study by the Argonne National Lab concluded that E85 produced from corn resulted in an 21%-29% reduction in greenhouse gases and cellulosic E85 would be an 86% reduction<sup>1</sup>. E85 is less flammable than gasoline. Pure ethanol is non-toxic, water soluble and biodegradable.

## What is the potential and future prospect for ethanol as a fuel?

Expanding E85 use through increased availability of affordable consumer options for FFVs combined with competitively priced E85 at fueling stations, will also help increase ethanol use. Further research and development into cellulosic ethanol (using sugars from plant materials such as switchgrass) will also increase U.S. capacity for ethanol production and use. In order to reduce the impact of greenhouse gases (GHGs) and land use change pressures associated with ethanol-based fuels, the EPA requires ethanol to meet lifecycle GHG thresholds of 60% for cellulosic biofuel and 20% corn-based ethanol produced in new facilities.

## Resources:

DOE's Alternative Fuels Data Center [www.eere.energy.gov/afdc](http://www.eere.energy.gov/afdc)  
 American Coalition for Ethanol [www.ethanol.org](http://www.ethanol.org)  
 Growth Energy [www.e85fuel.com](http://www.e85fuel.com)



<sup>1</sup> (Wang, Michael "Energy and GHG Emission Impacts of Fuel Alcohol" Argonne National Lab, 2005 [www.transportation.anl.gov/pdfs/TA/347.pdf](http://www.transportation.anl.gov/pdfs/TA/347.pdf))

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